SET
eDigest

"Computing is not about computers any more. It is about living"
Nicholas Negroponte

School of Engineering and Technology

Preface

Dear Sunway colleagues as well as our friends, collaborators, and partners both in Malaysia and overseas,

I am feeling very happy and proud of the excellent results the School of Engineering and Technology (SET) has achieved since our last communication with you through this quarterly eDigest. Despite the challenging staffing and financial conditions of 2022 combined with overall slower growth in the first half of the year, the School has managed to perform exceptionally well in practically every aspect of our operations. It would not be wrong to say that it is absolutely clear now that the major targets and performance indicators for the year will be achieved. Our student population growth pattern is truly spectacular. Indeed, the increase has been at more than 15% annually on average for the last 5 years. The School's research performance has been equally strong. In areas such as research publications, new PhD student enrolments, positive outcomes of research grant applications, and new productive collaboration agreements with external partners SET at least doubles its results during these recent years. It is important to state that this progress was achieved without any significant growth of the academic, research, and admin staff numbers. This shows that we have been working smarter with every new year. Therefore, it is not of a surprise that many of our highly productive staff members have become recipients of a multitude of various awards and distinctions including the Best Faculty Award from the Malaysia Digital Economy Corporation (MDEC), which is the country's leading agency driving the national Malaysia Digital programme.

However, like everything in our life, there is a natural limit to our growth that has been of a largely intensive nature in recent years. Without solid strengthening through a new extensive-type growth round, the danger of coming to the plateau-type development has become evident. The Sunway Education Group, University, and School management have seen this problem and have initiated the relevant new developments and reinforcement steps. In fact, with the vital support and investment from the Jeffrey Cheah Foundation, the School has already well progressed in establishing and offering new Engineering programmes while also developing top-class relevant laboratories and workshop facilities. One more good example is the successful launch and the accelerated popularity of the online Master of Data Science programme. Another recently introduced flagship postgraduate qualification - Doctor of Philosophy in Sustainable Science and Technology is getting stronger steadily while attracting high-quality applicants globally. There are several other new programmes and physical infrastructure developments in the pipeline. Arguably, the most significant of them will be the forthcoming relocation of the Engineering area of SET to redeveloped and refurbished premises in the specialist Engineering Complex in the near future. In addition to that, the School expects to receive the required extensive financial and manpower support through the Budget 2023 planning exercise.

Summarising, our achievements have been of a truly high calibre and the School is on a right track to complete the year 2022 very successfully. Yes, there are challenges to sustaining the impressive growth we have enjoyed in the previous years. However, at SET we all have learnt to work smarter and more productive while maintaining the expected high quality of what we are doing. SET is sincerely grateful to the Sunway leadership for the provided continuing support and trust in our capabilities. We look forward to the forthcoming provisions of the new year's budget and to the expansion of our facilities that will further energise the School's upward progression.

Professor Serge Demidenko

Dean, School of Engineering and Technology

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Sunway University Listed Among the Top 10 Most Prominent Data Science Institutes

Professor Angela Lee Siew Hoong is a Professor at Sunway University. She was the one that introduced, developed, and is currently teaching Analytics and Data Science programmes at the University. Professor Angela Lee has been developing the data science curriculum since 2009. She prepares her students to enter the analytics workforce by staying up to date with the industry's needs. She was the key person to introduce the Analytics and Data Science degree at Sunway University.

Professor Angela Lee has developed many innovative ways to use data science tools from the most elementary level to advanced analytics. She teaches Social Media Analytics, Visual Analytics, Advanced Analytics and Business Intelligence and authored many published articles in the area of churn analytics, sentiment analysis and predictive analytics. For her continued efforts in promoting data science, she was recognized by the SAS Institute as the 2021's 'Distinguished Analytics Educator of the Year'

The Sunway University Data Science programme offers students the diversity of applying data science to many different industries. The programme is designed in such a way that allows learners to apply their data science knowledge to help multiple different industries to solve real-world problems. The curriculum is up-to-date with the latest technology and tools used in the programme to close the gaps between the needs of industry and the graduates' skills. Professor Angela Lee highlights that the University has embedded SAS, Alibaba and AWS syllabus into the programme to empower students with the competencies and capacity to contribute to the fast-changing economic, social and technological world.

Sunway University prepares graduates to be career-ready to lead a productive, fulfilling and meaningful life with integrity and, by being ethical, accountable, resilient, caring and responsible members of the society. Professor Angela Lee reveals that at Sunway University, a multidisciplinary approach has been adopted in regard to data science. The students are taught to be flexible and creative and they are genuinely immersed in data science. Professor Angela Lee adds that Sunway University has a very high employability rate as students would have been employed well before they graduate from the programme.

Professor Angela Lee opines that by 2025, Malaysia's big data analytics industry is anticipated to be valued at US$1.9 billion. Malaysia has big intentions to grow its digital economy, with initiatives like the 'Malaysian Digital Economy Blueprint' indicating that data and digital technology would be a big part of the future. Dr Lee highlights that the Master of Data Science and Bachelor of Science Information Systems (Data Analytics) at Sunway University is designed to develop the data scientists of tomorrow by combining academic rigour with real-world experience to help students grow their data abilities and open doors to new possibilities. The university's programme also appeared in the Top 10 degree in Graduates Tracer studies, with 100% of graduates Employed and further studies.

Dr. Norshahirah from Graphene and Advanced 2D Materials Research Group, has been selected to participate in the prestigious Nobel Laureate Meeting

Dr. Norshahirah Binti Mohamad Saidi from Graphene and Advanced 2D Materials Research Group (GAMRG), School of Engineering & Technology, has been selected

as one of the 600 most qualified young scientists to participate in the 71st Lindau Nobel Laureate Meeting (Chemistry) as a nominee of the Global Young Academy. Among the GYA nominees, Dr. Norshahirah is the only one from Malaysia. This prestigious meeting is held once a year, and around 40 Nobel Prize Laureates convene at Lindau, Germany, to meet the next generation of leading scientists worldwide, including undergraduate, postgraduate and early career researchers. For this year, the event is scheduled from 26th June to 1st July 2022. The programme will have activities such as keynotes and panel discussions intended to enact the sharing of experience and knowledge between Nobel Laureates and other young researchers.

Dr. Norshahirah is currently working as a research assistant, and her research focuses on developing new materials for energy storage applications. She looks forward to meeting the Nobel Laureates, especially Prof. John Goodenough, Prof Stanley Whittingham, and Dr Akira Yoshino, who developed lithium-ion batteries. She is very excited to discuss the current issues and views on the future energy application with them and other Laureates. At the same time, she looks forward to building a strong collaborative network with other young scientists by sharing knowledge and new research ideas.

Distinguished Professor David Bradley set to be a Consultant to a UNDP supported Saudi Food and Drug Authority Project

The United Nations Development Programme (UNDP) works towards ending poverty, building democratic governance, rule of law, and inclusive institutions, advocating for change, also connecting countries to knowledge, experience and resources to help people build a better life.


Within the latter remit, Distinguished Professor David Bradley, Head of Sunway Research Centre for Applied Physics and Radiation Technologies (CAPRT), has recently been made a Consultant to the Saudi Food and Drug Authority (SFDA), supporting a UNDP project on national dose reference levels (NDRLs) arising from diagnostic imaging procedures, primarily to:

• Review/update methodology and process of NDRLs for different imaging modalities.
• Create guidelines for healthcare providers on applying NDRLs.

• Provide training to SFDA Executive Department of Radiological Health on monitoring DRLs.

The need is for guidance on the amount of ionizing radiation used in medical imaging procedures, defining processes by which, at a local healthcare facility in routine circumstances, the amount of ionizing radiation can be evaluated for a representative sample of patients. It is all part of a very much larger international effort aimed at optimizing diagnostic procedures, optimized towards maximizing the benefit to risk ratio in imaging. The project is expected to start imminently and to be completed by the end of this year.

SET Conference Seminar Series #3/2022
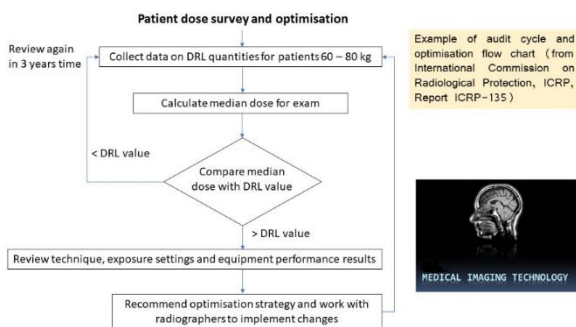
The SET Conference Seminar Series #3 2022 was held on Thursday, 14th July 2022 via MS Teams, attended by 28 academic staffs and students.

The seminar started with the Dean of School of Engineering and Technology, Professor Serge Demidenko welcoming the audience. He then introduced the first presenter, Assoc. Prof. Dr Chua Hui Na who gave a presentation on "Multifaceted Metrics for Assessing Privacy Policies using Text Processing and Clustering Analysis". This is followed by Professor Teh Phoey Lee Heard's presentation on "Pay to Play: Understanding Gamer's Motivation through Semantic Analysis". Finally, Professor Mayeen Uddin Khandaker presented on "The role of Nuclear Data for Production of Diagnostic and Theranostic Radionuclides." The presentation provided an overview on how technology can help in assessing privacy policies in official documents, analysing semantic that motivates gamers and putting nuclear into good use in the medical field.

Professor Mayeen delivered a keynote speech in a seminar on 'High Impact Journal Writing, Ethics and Plagiarism' at BGCTUB, sponsored by the Ministry of Science and Technology, Bangladesh

From the left, Assoc. Prof. Dr Talha bin Emran (Principal investigator of the project, Ministry of Science and Technology, Bangladesh), Professor Mayeen, Vice Chancellor of BGCTUB (Professor Dr. AFM Aworangazab), and Head of Pharmacy Dept. of BGCTUB. They were handing over a Plaque of Gratitude as well as giving floral reception to Professor Mayeen.

Professor Mayeen Uddin Khandaker was invited to deliver a keynote speech in a Seminar on 'High Impact Journal Writing, Ethics and Plagiarism' held at BGC Trust University Bangladesh (BGCTUB) on May 16, 2022. This seminar was funded by the Ministry of Science and Technology, Bangladesh, under a special allocation project fund. Also, this seminar has been covered by several Bangladesh daily newspapers (both Bengali and English daily newspapers), BGCTUB campus TV as well as electronic/social media.

A Peek into Shopee's Business Intelligence

This event commenced with a brief opening speech by SAS's emcee to introduce the speakers and pass the floor to the guest speakers from Shopee Malaysia. Then, a session on insights into automation projects done by the Business Intelligence Team of Shopee Malaysia took place. Thereafter, a Sunway University alumni shared her journey and experience entering Shopee, followed by a short Q&A session.

The objectives of the event were to provide knowledge on automation projects executed in the Business Intelligence Team of Shopee Malaysia. Moreover, it provided in-depth insights into Shopee's analytics for businesses to make strategic planning. Lastly, to provide participants with job & internship opportunities by sharing the journey of Sunway University graduates' in Shopee Malaysia.

Participants who were curious about what the people from the Business Intelligence Team did, gained insights into the Business Intelligence Team of Shopee. Mr. Jian Shen and Mr. Kenchen explained briefly the projects and tasks they handle on a daily basis. Mr. Kenchen briefly talked about a recent project he handled which involved web scraping social media platforms to randomly pick a winner based on social media posts with the hashtag #topupshopeepay. Furthermore, Ms. Abigail, who is a Sunway University Bachelor of Information Systems (Honours) (Data Analytics) Alumni, shared her experience from her time in Sunway to securing her job at Shopee. The participants learned that Abigail too was a member of the Sunway Analytics Society which helped build her skill sets. She also shared examples of the daily tasks she undertakes in Shopee.

A few participants mentioned in the Zoom chat that the feedback form was not accepting any responses. One of the Board of Directors reacted immediately to check the issue with the Google Forms and enabled the form to accept responses. To prevent such an obstacle from occurring in future events, all involving forms should be checked before an event begins.

Referring to the feedback, the majority of respondents gave positive feedback, indicating that the talk was fruitful and insightful. The respondents also found the session to be informative and valuable to their future career paths. They appreciated that the speakers tried to relate to students.

Consequently, the event was a remarkable achievement since participants gained a better understanding of the job scope of a person in the Business Intelligence Team in Shopee.

Critical Interference Management Operations in 5G

The wireless network is growing enormously which resulted in 5G, improve the spectrum resources in a most feasible manner. The base station construction to cover the coverage holes is an infeasible approach, hence 5G has evolved into a multi-layer network based on various technological advances. This multi-layer network offers an extensive range of wireless services. However, the deployment and operation of multi-tier wireless networks require a lot of planning, maintenance, and optimization. These multi-tier networks improve the spectrum utilization by

increasing the number of tiers, however, such a complex network design results in increased interference, backhaul, and QoS constraints.

The interference in HetNet among devices is categorized as co-tier intra-cell interferences which require an accurate count of channel information Not only this, self-organization is also critical in a static network; however, it becomes a real challenge in dense environments where devices have conflicting objectives. Also, the mobility of users affects the cooperation and strategic decision-making process. The mobile users in the network elevate the problem of resource management to a great extent, where traditional resource sharing and interference management solutions cannot be applied to achieve the QoS. The mobility of the users can be used to predict network load which can help not only to manage the resources efficiently but also it can help to minimize interference. It is quite challenging to predict the model in a highly mobile heterogeneous environment and the key challenge is to provide a most optimal solution with effective coordination. The aim of this research is to build a framework that leverages machine learning solution to solve the interference issue in a resource constraint environment while considering the mobility factor.

Dr Muhammad Aman, a Senior Lecturer from the School of Engineering and Technology of Sunway University, and his team is working on designing new

framework that leverages machine learning solution to optimise 5G wireless network. This research will help to resolve interference and resource management issues due to high mobility and its impacts on future wireless networks due to growing IoTs and virtual networks. The research articles related to this are intended to be published in Q-1 journals.
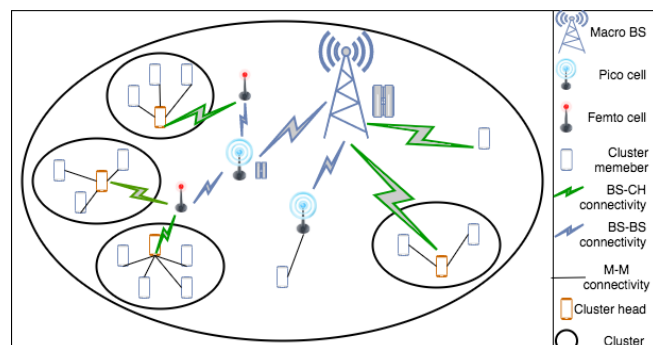
Euro-Asia Network on Carbon Dioxide Capture and Utilisation-A Partnership to Tackle Climate Change

Climate change is a real threat to life on earth to which carbon dioxide (CO_2) is recognized as the major contributor. This makes reduction in CO_2 emissions a worldwide emergency and priority. To combat climate change as a result of anthropogenic CO_2 emissions, efforts have already been put forth to capture and sequester CO_2 from large point sources, especially power plants; however, the utilisation of CO_2 as a feedstock to produce chemicals, materials, and fuels is a judicious strategy as it provides a more economical and sustainable solution than sequestration. Therefore, the importance of green technology and research has perhaps never been greater than at the current times due to ever rising social and environmental pressure for net zero-emission economy. Currently tremendous research worldwide is being carried out to tackle the challenge of integrating CO_2 capture with its utilisation.

A distributed social technology to capture CO_2 and H_2O from ambient air

Moving with this current race, Sunway University was one of the first Universities in Malaysia to adopt the 17

Sustainable Development Goals (SDGs) set by United Nations (UN) as a guide to shape the University research landscape by investing heavily in research to address these Goals. In this regard, a Research Centre for Carbon Dioxide Capture and Utilisation (CCDCU) was established in Sunway University by Professor Mohamed Kheireddine Aroua in January 2018, aiming to integrate CO_2 capture and Utilisation in order to develop innovative processes to make CO_2 capture from flue gases a profitable operation. However, this is a huge challenge that cannot be addressed by one person or one team or one University. Collaborations and partnership involving different research teams, different Universities and stakeholders from industries is the key to successfully tackle this challenge.

In this perspective, we realize the importance of partnership with the other part of the world as reflected in SDG17 to tackle climate change through CO_2 capture and utilisation. European counties proposing to integrate low or zero carbon emission approaches and emphasising through their research and industries. Therefore, we are currently establishing the 1st Euro-Asia CO_2 Capture and utilisation Network (EACO2CUNet) which comprises various local, regional and International Universities towards the achieving of CO_2 capture as one of the major versatile building blocks in the chemical industry within the next couple of decades.

CCDCU's researcher trying to identify the current challenges facing by the worldwide researchers in developing alternative CO_2 capturing agents that are greener and more economic to be implemented in large scale and widespread use. Presently the estimated cost to capture a tonne of CO_2 by amine technology is around 55-60 US$. This cost must be reduced by almost a half to make the technology economically viable to be implemented to capture CO_2 from power plants, which is also an emphasising research focus in CCDCU.

CCDCU is trying to tackle these disputes by integrating with EACO2CUNet through several strategies such as developing new solvents and new processes. The goal is to integrate CO_2 capture with its use that converts captured CO_2 into useful chemicals and products, this is CCDCU's choice to make CO_2 capture and storage. CO_2 from power plants, cement plants, air, etc. is profitable and therefore attractive to investors. However, one of the most promising strategies is to use the captured CO_2 and convert it to useful chemicals as CO_2 can be a good starting material to synthesise a wide range of chemicals and fuels. On the other hand, realizing the promising diversified outstanding properties of advanced functional nanomaterials CCDCU is trying to implement those functional materials for the effective CO_2 capture and utilisation. Research on advanced functional materials have been shown excellent performance in CO_2 capture. CCDCU's research aim to achieve the scale up this process towards to industrial production level by optimal costing.
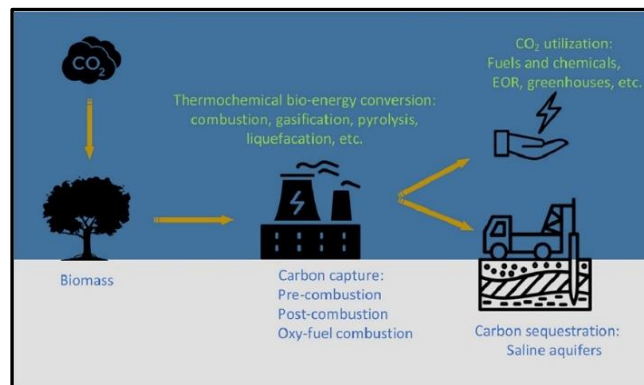
Microalgal carbon capture and biomass production

Recognising the importance new scientific discoveries and innovative emerging technologies to mitigate CO_2 emissions, as a member of the EACO2CUNet organizes seminars such as a 2-day seminar on 'Emerging Technologies for CO_2 Capture and utilisation' was organized by integrating multinational speakers including MIT, USA, Lancaster University, UK, Greece, Singapore, Korea, UAE, Pakistan, Indonesia along with speakers from Malaysia. Which shared core knowledge and discussed their most recent innovations, trends, techno-economic aspects, and concerns in particularly challenges encountered and solutions adopted in the field of CO_2 Capture and Utilisation. In this seminar, the CCDCU researcher also discussed their knowledge, activities, innovations, and displayed stat-of-the art laboratory in Sunway University.

These proactive activities in CCDCU, will definitely widen the horizon and synchronize the world leading researcher's work with the integration of EACO2CU network. Finally, the establishment of this EACO2CU network demonstrates the commitment to support the UN's SDG, particularly SDG13 on climate action, SDG9 on industry innovation and infrastructure and SDG7 ensure access to affordable and clean energy. This certainly will strengthen the capability of CCDCU to produce high quality research outcomes suing the state-of-the-art lab facilities and very strong team in Sunway University. It always invites potential students and collaborators for join research to be the part of this truly international EACO2CU network.

IRNGS2.0 -
Science and Technology
Beyond Borders

Innovative ideas and modern science. Super developing technologies with wide spread research radars for the next big wave of innovation, is tasked by connecting and exploring emerging science and technologies beyond borders. Epidemic and Pandemic may be restricted within borders, but the thirst to upgrade and the intense to explore is always expected to explode and collaborate beyond frontiers.


Professor Adarsh Kumar Pandey

To create a strong collaborative research network and to promote science and technology beyond borders, Professor Adarsh Kumar Pandey, Research Centre for Nano-Materials and Energy Technology (RCNMET), School of Engineering and Technology initiated a joint research network on advanced energy storage materials under "International Research Networks Grant Scheme (IRNGS)" supported by Sunway University (SunU) and Jeffrey Cheah Foundation. The subsequent motto of the IRNGS is to harness scientific excellence in clean and affordable energy (SDG7) and to meet global climate change challenges (SDG13) through advanced energy storage materials by supporting Sustainable Development Goals (SDGs) and 10-10 MySTIE.

In the first phase of the IRNGS, the team successfully conducted and contributed in the activities like organizing seminar on "Nanomaterials and Energy Storage" with participants globally, collaborated and utilized each other's research facilities to carry out high impact research; published joint research papers. As well, signed MoU, obtained joint research grants, established new collaborating partners and conducted online meetings with collaborating partners to discuss further strategies for phase-2.

Currently the IRGNS is in its second phase (IRNGS2.0) of progress which target to widen the team with new researchers with expertise in real time case studies to ensure self-sustainability. Other targets include organizing joint seminars/workshops/international conference and lecture series. As well, publishing high quality joint research articles, joint supervision of PhD and Master's students, submitting international and industry research grants and visiting partner countries and host partner institutes to further strengthen the research network.

As an individual we can do so little and as team we are intent to do so much. The IRNGS brings together interdisciplinary expertise from Sunway University with several top external collaborators. The team is Led by Professor Adarsh Kumar Pandey (RCNMET). The internal team members from Sunway University includes Professor Saidur Rahman (Head, RCNMET), Dr. Tan Kim Han (RCNMET) and Professor Yap Kian Meng (Sunway University Research Centre for Human-Machine Collaboration). The external collaborators include Dr. Ir. Krismadinata (Universitas Negeri Padang, Indonesia); Dr. P Abdul Salam (Asian Institute of Technology, Thailand); Dr. Kinnaleth Vongchanh and Dr. Sarin Chan, (Institute of Technology of Cambodia, Cambodia); Dr. Nguyen Van Cong (Can Tho University, Vietnam); Dr. Vineet V. Tyagi (Shri Mata Vaishno Devi University, India); Dr. Jamal Uddin Ahamed (Chittagong University of Engineering & Technology, Bangladesh); and Dr. Dranreb Earl Juanico (Technological Institute of the Philippines (T.I.P.), Philippines). Further, in IRGNS2.0, the team was expanded with addition of Dr. Yogeshwar Nath Mishra (NASA-Jet Propulsion Laboratory, California); Prof. Yogendra Kumar Mishra (Smart Materials Group SDU NANOSYD, Denmark); Dr. S.K. Tyagi (Indian Institute of Technology Delhi, India); Dr. Zafar Said (University of Sharjah, UAE); Professor Zhenjun Ma (University of Wollongong NSW, Australia); Dr. Jeyraj Selvaraj (University of Malaya, Malaysia); Dr. Mahendran Samykano (University Malaysia Pahang, Malaysia); Professor Kamal Sharma (GLA University, India); Dr. Belqasem Aljafari (Najran University, Saudi

Arabia); and Dr. V. Ashok Kumar (Chulalongkorn University, Thailand).
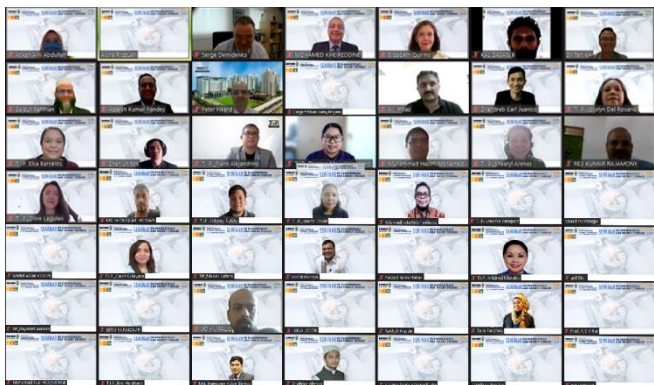
This experienced team of researchers are expected to work on novel nanoparticles and phase change materials for enhanced thermal energy storage with focus on application towards battery thermal management, solar photovoltaic and thermal systems, electronic cooling units, aerospace industries, refrigeration's and building heating & cooling. The prolong collaboration will ensure platforms for learning beyond the classroom, to transform students to be curious, research-oriented, innovative and responsive to societal needs. End outcome of this research network scheme would be to move a step towards sustainable development in team rather than an individual and to strengthen partnership between Sunway University and partner Institutions.

A Real-Time Counting Application of Printed Circuit Boards Assembly (PCBA) using Image Processing and Weight Detection Techniques

The Research Centre for Human-Collaboration (HUMAC), led by Professor Dr Yap Kian Meng, together with the members of HUMAC, Assoc. Prof. Dr Lee Yun Li and Assoc. Prof. Dr Lin Mei-Hua have successfully completed and delivered the prototype for real-time counting application of printed circuit boards assembly (PCBA) to Deng Kai Sdn. Bhd., supported by Company Director, Mr. Lian Thng Kaih, under Public-Private Research Network (PPRN) 2.0 Grant.

This project aims to solve the main issue of monitoring the production output in Deng Kai Sdn. Bhd., which specializes in the manufacturing of engineering components. Currently, affordable solutions for small and medium-sized enterprises (SMEs) to monitor production data in real-time that directly affects the operations of the company remain a challenge. For instance, the average output is capped at a certain amount which is far from the production capacity of the factory. Due to the lack of online monitoring solutions, the company cannot analyse and determine the real - time production output data. Besides, employees' task of counting components manually, frequent breaks, motivation and morale affected productivity.

Hence, to address these issues, a prototype Internet-of-Things (IoT) weighing scale system and a vision-based counting system were developed to monitor the production outputs in real time. Subsequently, a reward system was introduced to encourage the employees. The IoT weighing scale was developed with Arduino, sensors, and self-designed 3D printed materials, whereas, the vision-based counting system was developed with the Raspberry Pi and USB camera. Both the systems pass data to the cloud database which is powered by Amazon Web Service (AWS) to support the real time monitoring production output via the proposed Android mobile application. A simple user interface design of Android mobile application provides the managers to easily conduct monitoring of production output in real time.

Furthermore, the usability observations for both proposed systems and Android mobile application were carried out among the operators and managers in the company during software development iterations to meet the real-time environment process requirement. A reward system for the workers was also developed in tandem with the company's director. A reward system that sets a daily or monthly target rather than individual and team reward was recommended to overcome the challenges of daily changes in composition of the work teams. It was also recommended that additional recognition in form of a certificate of good attendance could be awarded to the employees to boost workers' motivation, morale, and productivity.

The reward system fosters healthy competition between teams. The IoT weighing scale and vision-based counting systems motivate the teams to speed

Prototype of IoT applications for monitoring production output in real time: IoT Weighing Scale System
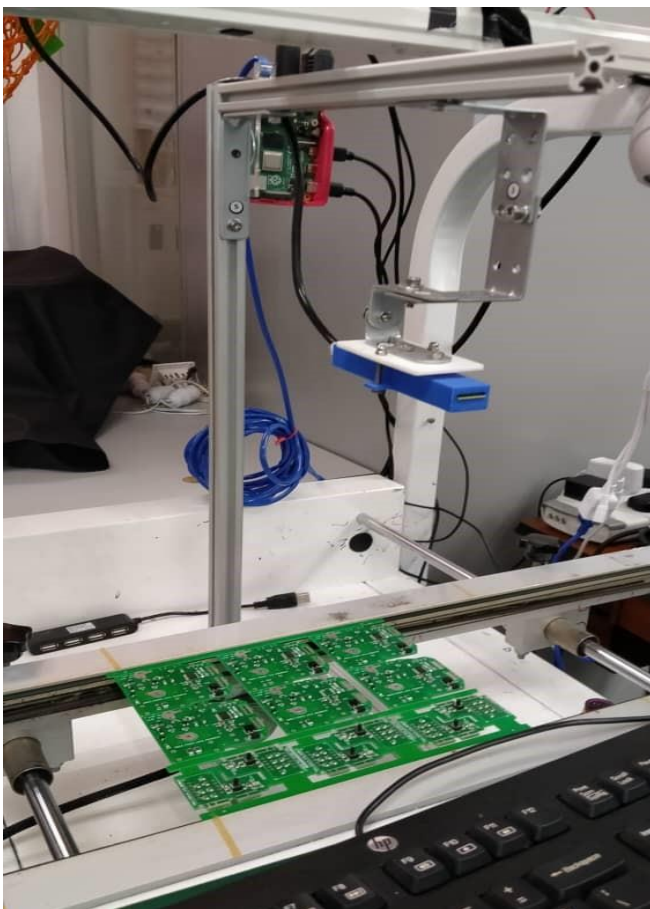
Prototype of IoT applications for monitoring production output in real time: Vision-based Counting System

up the production process, and any delay or breakdown can identify and address within a short period. Therefore, this project has increased production efficiency. This real-time monitoring system could increase the revenue by identifying the causes of the delay. Furthermore, with the automated monitoring, weighing scale, or counting solutions, the company has freed up the low-level skills of staffing, who perform the tasks manually, and created higher-level job opportunities.

This project directly contributes to the growth of industries, innovation and infrastructure which is the ninth goal in the sustainable development goals (SDG) set by the United Nations General Assembly in 2015. Furthermore, upon completion of this PPRN 2.0 project, Deng Kai Sdn. Bhd. the Director, Mr. Lian has agreed to continue the support to the project as part of HUMAC and Department of Computing and Information Systems (DCIS) for final year industry project on vision-based inspection of PCBA quality using machine learning techniques. This creates opportunities for DCIS students to solve real world problem and possibly explore career opportunities with potential industries.

5G and Energy Efficiency

5G is the fifth generation of wireless technology. It is making big waves of progress around the world. Telecommunications providers and device manufacturers are making rapid progress towards integrating 5G wireless networks. 5G will bring enormous benefits by making it capable of providing much more efficient networks, enabling new services and new ecosystems. It can provide higher speed, lower latency and greater capacity than 4G LTE networks.

According to Ericsson Mobility Report published in June 2022, there was a 10 percent growth of mobile network data traffic quarterly between Q4 2021 to Q1 2022. Total monthly global mobile network data traffic reached around 93EB. It has doubled in just two years since Q1 2020. This traffic growth is driven by both the rising number of smartphone subscriptions and an increasing average data volume per subscription.

Due to the high usage of data network, energy usage will also bring with it. With increased amounts of base stations and antennas needed to power the network, new energy-efficient schemes need to be established to counter this higher power usage. One such way of doing them is to maximize energy efficiency through maximizing sleep-wake scheduling. Sleep-wake scheduling works by having only the necessary base stations nodes that need to be active turned on and the

rest put in a sleep state. This helps minimize energy usage by having the nodes that are not needed to be put in a sleep state.

Due to user mobility and varying traffic demand, the number of small cells that are required to satisfy the quality of service (QoS) requirements, which are dynamic in nature, of heterogeneous users (or user equipment, UE), such as tablets, mobile phones, gaming consoles, e-readers, and machine type devices, that generate a diverse range of traffic patterns. Naturally, there is an unequal distribution of traffic load among base stations, causing some base stations to incur higher energy consumption. So, there is an urgent need to design a mechanism to distribute traffic loads among base stations while taking energy consumption into consideration during the wake period.

Sleep-wake mechanism of base stations has been proposed by many researchers along the way to save energy consumption in cellular networks. Sleep mode is a low-power intermediate state whereby the base stations switch off partially, or fully, to provide energy efficiency; and this is possible when they are not fully utilized. Nevertheless, a quick transition from the sleep mode to full operation mode when necessary. So, there is an urgent need to design a mechanism to select which base stations to sleep (i.e., when they are not in need), and to wake up (i.e., when they are required to send, receive, or handle packets).

In order to carry out the sleep-wake mechanism among the base stations, there are few challenges needed to be addressed. Massive amount of heterogeneous traffic which is generated by a large number of heterogeneous user equipment in an ultra-densified network. Large deployment of small cells which can cause the overprovisioning and underutilization of resources, and further on will cause energy consumption to increase. Coverage constraints refers to the capability of the base station to sense the existence of user equipment and to transmit data with the base stations, with distance and workload of the base stations in mind.

In Sunway University, one of the research areas carried out by Ms Charis Kwan, a Lecturer of Department of Computing and Information Systems with her team is to find the best solution to overcome these challenges and to deploy the small cell networks with energy efficiency to boost the signal in 5G networks while conserving energy saving.

Ms Charis Kwan Shwu Chen
Department of Computing and Information Systems

From Diploma to Master's: A Journey

Before enrolling in Sunway University's Master of Data Science, I was a Bachelor of Science (Honours) Information Systems (Business Analytics) degree student, so I do have an analytical background in the data field. However, roughly 90% of my classmates are from different professions such as marketing, business, or computer science. I believe what attracts students to this course is the ability to advance in a data-driven environment, where data science offers a more technical focus in terms of statistics, machine learning, and programming. These skills would then enable graduates to work in technology, entertainment, telecommunications, or as consultants. Given that I have only recently completed my third course, I am eager to see what the next few courses will bring to the table. Likewise, my most rewarding experience has been the opportunity to explore data using Tableau as

well as assessments similar to real-world client reports because I get to use the latest tools from Tableau and I have discovered that there are a variety of data sources that can be used, which will be useful for my future clients.

Jarrod Tham

In the Master of Data Science programme, every subject includes both a lecturer and an online facilitator who will educate and guide the students throughout the course. One of the online facilitator's passion for data science and analytics really inspired me. When I was stuck on a certain issue, he would advise me on approaching the problem from a different angle or perspective, which helped me to discover important clues on analytical thinking abilities to comprehend and strengthen my skills as an upcoming data scientist. Furthermore, the flow of communication, as well as his compassionate characteristics, encouraged me substantially throughout the subjects. Not only is he detailed in describing how and why, but he also presented real-life examples that would restructure the issue in a more advantageous way, providing a clear path to travel through, which I suppose is what the word "guiding" refers to.

It's been a thrill going from a student who started my Diploma in IT in 2016 to a Bachelor of Science (Honours) Information Systems (Business Analytics) degree in 2019, and now a Master's in Data Science which will be completed by the end of 2024. However, my path has not been without ups and downs, the most of which have been the people I've met and lost. What I would encourage incoming students is that you actually get to experience the world as it is, you will encounter people who impact you in both positive and negative ways, but what decides the outcome is your determination to walk down the road that you believe is best for your future. It may involve multiple sacrifices, some of which may be beneficial or unpleasant, but these decisions are what strengthen us and lead us to be better students and people.

New Appointment

Dr Chew Ming Tsuey

2022 University Ethics Committee SET Representative

New SET Members

Dr Saad Aslam

Senior Lecturer

Department of Computing and Information Systems

Dr Yong Yoke Leng

Senior Lecturer

Department of Computing and Information Systems

Lewis Tee Jen Looi

Assistant Manager - Laboratories

SET Admin

2022 SEG Academic Appreciation Day

Award 2022	Staff Name
SU Student Appreciation of Teaching Award	Dr Chia Wai Chong
SU Student Appreciation of Teaching Award	Lim Woan Ning
SU Student Appreciation of Teaching Award	Dr Matthew Teow Yok Wooi
SU Student Appreciation of Teaching Award (Commendation)	Professor Saidur Rahman
Award for Excellence in Research	Professor Adarsh Kumar Pandey
Award for Excellence in Research (Commendation)	Professor Mayeen Uddin Khandaker
Award for Excellence in Research for Early Career Researcher	Dr Numan Arshid

Research Collaboration

Staff Name	Department/ Centre/ Group	Partner/ Institution	Validity	Purpose of Scope
Professor Saidur Rahman	Research Centre for Nano-Materials and Energy Technology (RCNMET)	KPR Institute of Engineering and Technology, India	4 Aug 2022 - 4 Aug 2025	a) Develop academic research and collaboration in areas of advanced materials and their application in energy, heat transfer, energy storage, renewable energy, desalination. b) Faculty and student exchange c) Exchange of scholarly materials and information d) Participation in joint or collaborative research projects and grants e) Articulation arrangement for students to complete their course of study and graduation, provided all conditions and standards for admission and respective programmes are fulfilled.
Professor Yap Kian Meng	Research Centre for Human-Machine Collaboration (HUMAC)	Malaysian Association for the Blind (MAB)	1 May 2022 - 30 April 2025	a) Develop academic and cultural exchange in areas of education b) Exchange of scholarly and engineering materials and information c) Participation in joint or collaborative research projects and grants
Professor Yap Kian Meng	Research Centre for Human-Machine Collaboration (HUMAC)	Funlead Corp.	1 May 2022 - 30 April 2024	a) Develop academic and cultural exchange in areas of education b) Faculty and student exchange c) Exchange of scholarly materials and information d) Participation in joint or collaborative research projects and grants e) Articulation arrangement for students to complete their course of study and graduation, provided all conditions and standards for admission and respective programmes are fulfilled.

FRGS Grant 2022

Project Lead	Dept	Project Title
Dr Athirah Mohd Ramly	Department of Computing and Information Systems	Machine Learning with Cross OSI Layer Approaches in Autonomous Factory Deployment for Ultra-Reliable 6G Mobile Communications
Prof. Angela Amphawan	Department of Computing and Information Systems	Unmanned Aerial Vehicle-based Spatial Mode Diversity Free-Space Optical System for Reducing Link Failure During Flood Recovery Communications

Upcoming Events

Date(s)	Event
20 September 2022	Online Seminar on Improving Research Capability at Undergraduate Level
26 September 2022	Webinar: Smart Electroanalytical Sensors for User-friendly Monitoring of Disease Biomarker
28 - 29 November 2022	1st Sunway-Asian Oceania Radiation Physics Workshop
6 - 8 December 2022	The 2nd Euro-Asia Conference on CO2 Capture and Utilisation
13 - 15 December 2022	International Conference on Emerging Materials for Sustainable Energy and Environment (EMSEE-2022)